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ORIGINAL ARTICLE

Long-term follow-up of individuals undergoing sex reassignment surgery: Psychiatric morbidity and mortality

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ABSTRACT

Background: There is a lack of long-term register-based follow-up studies of sex-reassigned individuals concerning mortality and psychiatric morbidity. Accordingly, the present study investigated both mortality and psychiatric morbidity using a sample of individuals with transsexualism which comprised 98% ($n = 104$) of all individuals in Denmark. *Aims*: (1) To investigate psychiatric morbidity before and after sex reassignment surgery (SRS) among Danish individuals who underwent SRS during the period of 1978–2010. (2) To investigate mortality among Danish individuals who underwent SRS during the period of 1978–2010. *Method*: Psychiatric morbidity and mortality were identified by data from the Danish Psychiatric Central Research Register and the Cause of Death Register through a retrospective register study of 104 sex-reassigned individuals. *Results*: Overall, 27.9% of the sample were registered with psychiatric morbidity before SRS and 22.1% after SRS ($p =$ not significant). A total of 6.7% of the sample were registered with psychiatric morbidity both before and after SRS. Significantly more psychiatric diagnoses were found before SRS for those assigned as female at birth. Ten individuals were registered as deceased post-SRS with an average age of death of 53.5 years. *Conclusions*: No significant difference in psychiatric morbidity or mortality was found between male to female and female to male (FtM) save for the total number of psychiatric diagnoses where FtM held a significantly higher number of psychiatric diagnoses overall. Despite the over-representation of psychiatric diagnoses both pre- and post-SRS the study found that only a relatively limited number of individuals had received diagnoses both prior to and after SRS. This suggests that generally SRS may reduce psychological morbidity for some individuals while increasing it for others.

KEYWORDS
Follow-up, gender identity disorder, mortality, psychiatric morbidity, sex reassignment surgery (SRS), transsexualism

Since 2002 all individuals in Denmark referred with a diagnosis of transsexualism have been treated at the Sexological Clinic, Gender Identity Unit, University Hospital of Copenhagen (GIUUC).

According to the *International Statistical Classification of Diseases and Related Health Problems* 10th edition (ICD-10) an individual may be diagnosed with transsexualism if: (1) the person has the desire to live and be accepted as a member of the opposite sex, (2) usually a sense of discomfort with, or inappropriateness of one's anatomic sex, and (3) a wish to have surgery and/or hormonal treatment to make the body as congruent as possible with the preferred sex. In the ICD-10, transsexualism is categorized as a subgroup of gender identity disorders (GID) (1).

In Denmark, individuals with GID are commonly referred to the GIUUC under the ICD-10 codes DF 64.0–64.9 (1) by a general practitioner (GP) or psychiatrist for assessment and clinical evaluation. Assessment and clinical evaluation includes blood sample analyses for chromosome and hormonal abnormalities, physical examination, screening for psychiatric morbidity, psychological testing, and monthly sessions with a psychologist or psychiatrist.

Following assessment and clinical evaluations the process of sex reassignment surgery (SRS starts with cross-sex hormonal treatment for a period of at least 12 months). Subsequently, an application to the Danish Health and Medicines Authority for permission to undergo SRS may follow. SRS may include both castration and genital reconstructive surgery (2). The costs of the treatment are paid for by the public Danish Medical System. Today the Danish legal criteria for castration and genital SRS are: an ICD-10 diagnosis of transsexualism (F64.0), a persistent wish for and understanding of the consequences of castration, and a

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minimum age of 18 years. The minimum age for castration at the time of the present study was 21 years. According to national guidelines the evaluation period before being eligible to apply for SRS is a minimum of 1½ years. Since 2014 it has been possible to obtain legal sex change without having received medical treatment by application to the Ministry of Economy and Interior Affairs.

SRS has been practised for more than 60 years and is the internationally recognized treatment to ease gender dysphoria in individuals with transsexualism (3,4). Despite the long history of treatment, few and opposing data on mortality and psychiatric morbidity among sex-reassigned transsexuals are available. Accordingly, whether individuals with transsexualism and GID in general are at increased risk of psychiatric morbidity and/or have higher mortality rates compared with individuals without transsexualism are discussed.

In a Japanese study (5), among 603 individuals with GID (60.3% female to male (FtM); 39.7% male to female (MtF)) attending a gender clinic, current psychiatric morbidity was found among 19.1% of MtF and 12.0% of FtM. On this basis it was concluded that transsexualism was not associated with increased rates of severe co-morbid psychological findings. This conclusion was supported by the results of a study by Cole et al. (6) of 435 patients evaluated for hormonal and surgical treatment at a gender clinic in Texas, USA. This study found that less than 10% evidenced problems associated with mental illness. Further, Bandini et al. (7), in an Italian study of 100 individuals with GID found that body uneasiness in GID was not linked to general psychopathology. Finally, concerning mortality, Dutch studies (8–10) among individuals diagnosed with GID have reported that mortality rates post-treatment with cross-sex hormones was no higher than that of the general population, the Dutch studies did not separate individuals who only had cross-sex hormones and those who both had cross-sex hormones and SRS.

In contrast to the studies above, other studies have indicated that individuals with GID may both hold more psychiatric morbidity, besides GID, and higher mortality rates as compared to other populations. In a meta-analysis of 28 studies including a total of 1833 individuals with GID (11) a lifetime prevalence of Axis 1 disorders, specifically depression and anxiety, was found among 71% of included individuals. Furthermore, it was found that GID individuals with a pre-existing severe psychopathology had retained more psychopathological symptoms and had worse outcomes in the domains of social and psychological functioning, post-transition, as compared with GID individuals with no pre-existing psychopathological symptoms (5,12–15).

In a Nordic context, a Swedish study by DHejne (16) of 324 sex-reassigned individuals found a fourfold risk of being hospitalized for sex-reassigned individuals included, due to psychiatric morbidity, as compared to the general population. Further, the risk of all-cause mortality in SRS individuals was found to be three times higher than that of the general population (16).

To date, the only published Danish study of individuals with transsexualism is an interview study including 37 individuals diagnosed with transsexualism who had undergone SRS during 1958–1977 (29 MtF, 8 FtM) (17,18). In this study, no MtF suffered from severe psychiatric morbidity and the vast majority (83%) reported feeling physically better after SRS. However, three MtF were reported deceased by suicide. Among FtM, two FtM were reported as ''hospitalized with psychiatric morbidity'' after SRS while none were reported as deceased by suicide. Although methodologically and statistically the Danish study suffered from a number of limitations the conclusion, that FtM seemed to overcome post-operative difficulties and function better post-SRS than MtF, is in line with the majority of comparable studies (11,19–22).

More generally, major methodological problems related to the study of psychiatric morbidity and mortality in transsexuals and GID, including many of the studies cited above, include small sample sizes, participant heterogeneity, recruitment and diagnostic biases and inconsistencies (e.g. place of participant recruitment, differences in the diagnostic criteria of GID), high drop-out rates and limited follow-up periods (16).

The aims of the current study were therefore to investigate psychiatric morbidity and mortality using register-based data in a cohort of nearly all (98%) of Danish individuals with transsexualism who underwent SRS during a more than 30-year period (from 1978–2010). Specifically:

Aim 1: To investigate psychiatric morbidity before and after SRS among Danish individuals with transsexualism who underwent SRS during the period of 1978–2010.
Aim 2: To investigate mortality among Danish individuals with transsexualism who underwent SRS during the period of 1978–2010.

Methods

Procedure

The study was approved by the Danish Data Protection Agency and the Danish Health and Medicines Authority. Permission was obtained from the Civil Law Board to

Table 1. Baseline data.

Variables	Male to female $n = 56$ (%)	Female to male $n = 48$ (%)
Mean age at referral, years (SD)	30.3 (9.8)	27.0 (8.7)
Mean age at permission for SRS, years (SD)	37.1 (9.7)	32.6 (8.0)**
Mean age at initiating cross-sex hormones, years (SD)	32.0 (9.9)	29.8 (8.4)
Number of sessions at Gender Unit (%)		
1–30	30 (53.6)	23 (47.9)
31–60	20 (35.7)	22 (45.8)
>60	4 (7.1)	2 (4.2)
Unknown	2 (3.6)	1 (2.1)
Mean length of follow up in years after SRS (SD)	16.38 (7.1)	10.21 (6.1)

SD, standard deviation; SRS sex reassignment surgery.
Pearson χ^2 test: *$p \leq 0.01$, **$p < 0.001$.

identify names and Social Security numbers of all individuals who had undergone SRS from 1978–2010 and who were treated at the GIUUC.

National registers

Since 1970 the Danish Psychiatric Central Research Register has electronically registered all inpatients treated at psychiatric departments in Denmark. Outpatients have been registered since 1995. The Register contains date of onset and end of treatment and diagnoses of all psychiatric episodes given at the hospitals. Diagnoses were/are coded according to the eighth version of the ICD (1969–1993) or ICD-10 (1994 onwards) (1). Data from 1970 to January 2013 was included in the study.

The Cause of Death Register has recorded all deaths and causes of death in Denmark since 1970. Death events occurring up to April 2014 were included in the study.

Study population

A total of 104 individuals (56 MtF and 48 FtM), diagnosed by a psychiatrist according to ICD-8/ICD-10 criteria of transsexualism (1) at GIUUC were included in the study. All participants underwent castration in the period of 1978–2010 and had permission from the Danish Health and Medicines Authority to undergo SRS. Verification that an individual had undergone castration was done through CPR number (social security number). From this information on, the gender of the person can be easily identified. That is, equal numbers indicate assigned female sex and odd numbers assigned male sex. Accordingly, changes from equal to odd numbers or vice versa of any of the targeted individuals would verify castration. Surgical procedure codes could not be used due to the lack of a specific code for SRS, therefore date of SRS (start of follow-up) was defined as the date of permission to undergo castration. Data was drawn from both the social security number of the assigned sex, and the reassigned sex. Baseline data (Table 1) were obtained from medical records. These data were obtained based on interviews performed by specialized psychiatrists, psychologists, and medical doctors at the GIUUC during the treatment period.

Measures

We studied psychiatric morbidity before and after permission to undergo SRS. More specifically, we investigated psychiatric diagnoses (gender identity disorders excluded) given to the patient from 1970 up until January 2013. Consequently, each individual could present with several different diagnoses, but multiple contacts with psychiatric care with the same diagnosis only had one outcome pre-SRS and one outcome post-SRS. In addition, time and cause of death following the permission for SRS were included in the study. Data on death were drawn up until April 2014.

For each diagnosis, i.e. anxiety (ICD-10 F40.0–49.0), depression (ICD-10 F30.0–39.0), substance abuse (ICD-8 303–304, ICD-10 F10.0–19.0), personality disorder (ICD-10 F60.0–63.0), neurotica personalis (ICD 8 300–309), and psychosis (ICD 8 290–299, ICD 10 F20.0–29.0), individuals included were stratified by diagnostic group membership (i.e. received the diagnosis, did not receive the diagnosis) and assigned sex (i.e. MtF or FtM).

Mortality was studied by the cause of death certificate. Consequently each individual was either dead, data on death certificates were drawn, or not dead.

Statistics

Statistical analyses were conducted in SPSS version 19.0. The psychiatric and clinical variables were analysed using descriptive statistics. Means and standard deviations (SD) were calculated for continuous variables. Frequencies and percentages were generated for

Table 2. Number of psychiatric diagnoses.

	Pre-SRS		Post-SRS	
	Male to female $n = 56$ (%)	Female to male $n = 48$ (%)	Male to female $n = 56$ (%)	Female to male $n = 48$ (%)
Anxiety ICD-10				
Yes	0	4 (8.3)	6 (10.7)	5 (10.5)
No	56 (100.0)	44 (91.7)	50 (89.3)	43 (89.5)
Depression ICD-10				
Yes	3 (5.4)	3 (6.3)	9 (16.1)	3 (6.3)
No	53 (94.6)	45 (93.7)	47 (83.9)	45 (93.7)
Abuse ICD-10				
Yes	0	2 (4.2)	0	4 (8.3)
No	56 (100.0)	46 (95.8)	56 (100.0)	44 (91.7)
Abuse ICD 8				
Yes	0	1 (2.1)	0	0
No	56 (100.0)	47 (97.9)	56 (100.0)	48 (100.0)
Personality disorder ICD 10				
Yes	0	4 (8.3)	5 (8.9)	3 (6.3)
No	56 (100.0)	44 (91.7)	51 (91.1)	45 (93.7)
Neurotica personalis ICD 8				
Yes	9 (16.1)	8 (16.7)	0	0
No	47 (83.9)	40 (83.3)	56 (100.0)	48 (100.0)
Psychosis ICD 8/10				
Yes	7 (1.7)	7 (4.0)	2 (3.6)	2 (4.1)
No	9 (98.3)	1 (96.0)	54 (96.4)	46 (95.9)
Any psychiatric diagnose				
Yes	19 (49)	29* (41)	22	17

SRS, sex reassignment surgery.
Pearson χ^2 test: *$p \leq 0.01$, **$p < 0.001$.

Table 3. Individuals with one or more psychiatric diagnoses.

	Pre-SRS		Post-SRS	
	Male to female $n = 56$ (%)	Female to male $n = 48$ (%)	Male to female $n = 56$ (%)	Female to male $n = 48$ (%)
Individuals with $\geq$1 psychiatric diagnoses (%)	19 (33.9)	10 (20.8)	15 (26.8)	8 (16.7)

Four MtF and three FtM had psychiatric morbidity both before and after SRS.
SRS, sex reassignment surgery.
Pearson χ^2 test: *$p \leq 0.01$, **$p < 0.001$.

nominal and categorical variables. Between-group differences were analysed using chi-squared tests, t-test and Fisher's exact test.

No missing values were found for the psychiatric outcome variables as they were obtained from register data, where values, in the first place, are either present (affected) or missing (unaffected).

Results

Mean age of participants and baseline data related to age of referral, permission for SRS, sex reassignment hormonal initiation, number of session at GIUUC, and years of follow-up can be found in Table 1. As can be seen from Table 1 significant difference between MtF and FtM was found for mean age at permission to undergo SRS where MtF were found to be significantly older than FtM.

Data related to psychiatric diagnoses pre- and post-SRS can be found in Table 2. Data on individuals with one or more psychiatric diagnoses besides transsexualism/GID can be found in Table 3. As can be seen from the table a total of 29 of 104 individuals were given one or more psychiatric diagnoses pre-SRS while 23 of 104 individuals were given one or more psychiatric diagnoses post-SRS. A total of 22 individuals were diagnosed with psychiatric morbidity pre-SRS but had not received further diagnoses post-SRS to January 2013. Sixteen individuals who were not diagnosed with psychiatric morbidity pre-SRS were diagnosed with psychiatric morbidity post-SRS. Seven individuals received psychiatric diagnoses indicative of psychiatric morbidity both pre- and post-SRS. Psychiatric diagnoses on the seven individuals can be found in Table 4.

In relation to mortality, from post-SRS to April 2014 a total of six MtF and four FtM were deceased (mean age MTF 53.5 (SD 7.9, median 55.5), FTM 53.5 (SD 7.3, median

Table 4. Diagnoses for individuals with pre- and post-psychiatric morbidity.

	Pre-SRS							Post-SRS						
	MtF				FtM			MtF				FtM		
Individual no.	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Anxiety ICD-10					√			√	√				√	
Depression ICD-10	√		√					√		√				√
Abuse ICD-10													√	√
Abuse ICD-8				√							√			
Personality disorder ICD-10												√		
Neurotica personalis ICD-8	√	√				√	√							
Psychosis ICD-8/10		√		√		√	√						√	√

52.5), p = not significant). Causes of death included suicide 2 (19 and 26 years after SRS), smoking and alcohol related diseases 4, heart diseases 2, cancer 1, ulcer 1.

Discussion

We report on the first register-based SRS follow-up study in Denmark including 98% of all individuals in Denmark who have undergone SRS during the period of 1978–2010.

Pertaining to study aim 1, we found that 28% of the study group had been diagnosed with psychiatric morbidity pre-SRS and 22% post-SRS. No significant differences were found between the number of MtF and FtM individuals suffering from psychiatric morbidity pre- and post-SRS, although significantly more psychiatric diagnoses overall were present in the FtM group. Further, approximately 7% of the sample received a psychiatric diagnosis both pre- and post-SRS indicative of psychiatric morbidity both before and after SRS.

These results indicate that overall, individuals undergoing SRS in the Danish public health system hold considerable psychiatric morbidity besides GID both pre- and post-SRS. Using psychiatric diagnoses as an indicator of psychological/psychiatric well-being, our findings did not support previous studies that found FtM to be better functioning than MtF (11,16,23,24). Pre-SRS we did not find significantly more FtM with psychiatric morbidity, but those suffering from psychiatric problems had multiple diagnoses. Seven individuals had psychiatric morbidity pre- and post-inception, indicating that 23 individuals had been cured of psychiatric suffering from the start of the study period until the time of SRS. Seventeen individuals without psychiatric morbidity pre-SRS, were given a psychiatric diagnosis post-SRS. Further studies are needed to explore this issue.

Anxiety, depression, and neurotica personalis constituted the majority of psychiatric diagnoses found in the present study. This finding is in line with comparable studies in the area which have generally found that transsexualism was associated with anxiety and depression both before and after SRS (15,25,26).

Pertaining to study aim 2, almost 10% of the study population died at a mean age less than 60 years where the life-expectancy of assigned females and males in Denmark is 81.9 years, and 78.0 respectively. Although limited by the number of individuals included in this study, the results may provide some indication that SRS individuals are at increased risk of mortality post-SRS and thus that medical and clinical attention to this area of concern remain important (16,27,28).

In the present study two deaths were due to suicide. Although this number is far too small to come to any conclusions on, it is found in several other studies that individuals with transsexualism have a higher risk of suicidal ideation, attempts, or actual suicides (9,12,21, 29–33). Some studies attribute this to stress caused by stigmatization and gender abuse that may increase the probability of depression, anxiety, and suicide attempts of LGBT minority groups including transsexuals (34–40). In this connection a previous study on this present cohort (41) found an over-representation of problems related to school, education and employment which may explain both the elevated mortality and psychiatric morbidity rates as compared to the general Danish population (42).

Clinically, the results of the present study stress the importance of social and psychiatric counselling, support and follow-up of individuals preparing for or having undergone SRS. This may be especially relevant for the unknown number of self-identified transsexuals or publicly diagnosed transsexuals who do not consult the Danish public health system for SRS but never the less receive SRS abroad at their own expense.

Limitations

The present cohort includes only individuals who received permission to undergo SRS during a period with strict criteria for obtaining permission to undergo SRS. Accordingly, the group is highly selected and may not reflect transsexuals per se in Denmark.

Although we had a very large cohort for this type of study, some of our statistics may still suffer from low statistical power, thus increasing the chance for type II errors. Especially in regard to mortality, the cohort and the number of deaths did not hold enough statistical power to confirm or refute previous study findings.

Since most psychiatric care is provided by GPs and other outpatient care, underestimation of the prevalence of psychiatric morbidity in this study is probable. Thus, the psychiatric morbidity rates presented in this study may actually be substantially higher.

In the present study seventeen individuals were diagnosed with neurotica personalis and 11 individuals were diagnosed with psychosis according to ICD-8 before SRS. Caused by change from ICD-8 to ICD-10 in 1993, we found no ICD-8 diagnoses after SRS. The high incidence of ICD-8 morbidity is most likely due to the clinical aetiology in the 1970s and 1980s that indicated that transsexualism was psychotic or personality disordered in origin (29,43).

Conclusion

Using a sample comprised of 98% of all individuals who have undergone SRS in Denmark during the period of 1978–2010 this study found substantially high rates of psychiatric morbidity among this cohort. No significant differences in psychiatric morbidity or mortality were found between MtF and FtM save for the total number of psychiatric diagnoses where FtM were found to hold a significantly higher number of psychiatric diagnoses overall. Despite the over-representation of psychiatric diagnoses both pre- and post-SRS, the study found that only a relatively limited number of individuals had received diagnoses both prior to and after SRS. This suggests that generally SRS may reduce psychological morbidity for some individuals while increasing it for others.

Disclosure of interest

The authors report no conflicts of interest. The authors alone are responsible for the writing of this paper.

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